Why It Is Crucial to Understand Thinking and Feeling: An Analysis and Application to Drug Abuse

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Behavior analysis has long accepted the legitimacy of the analysis of private events in a natural science of behavior. However, the topic has languished as a focus of empirical research in either applied or basic arenas. We argue that recent empirical work examining the bidirectional nature of verbal relations may shed light on the role of private events in complex human behavior. Skinner argued that although it would be possible to analyze private events, we need not, because thoughts and feelings were viewed as co-occuring products of the same contingencies that are responsible for changes in overt responses. However, the bidirectional transformation of stimulus function inherent in verbal behavior changes the way that private events participate in complex behavioral episodes for verbal organisms. We examine why we have reached such a conclusion, with special emphasis on the role of self-awareness. Finally, we conclude with an application of our analysis to the problem of substance abuse.

Key words: cognition, emotion, private events, substance abuse, alcoholism, self-awareness, relational frame theory, verbal behavior, derived stimulus relations, bidirectionality

A scientific analysis of human private events has been philosophically included in behavior analysis for over 50 years (Skinner, 1945/1972), but it has been largely excluded from empirical research within this tradition (Taylor & O'Reilly, 1997). At times the exclusion is based on methodological concerns, very much in line with Watson's (1924) methodological rejection of introspection. In this view, because interobserver agreement is seemingly impossible with private events, they ought not to be included in scientific study (e.g., Lamal, 1998; Zuriff, 1988). At other times the exclusion is pragmatic, in line with Skinner (1953), who argued successfully that an understanding of private events was scientifically legitimate within behavioral psychology, but that it was unnecessary for a scientific understanding of overt activity. An extensive empirical literature on conditioned emotional responses

exists in the classical conditioning literature, but this literature ultimately does not provide either an adequate means or a sufficient reason to study ongoing emotional responses in humans. Thus, in behavior analysis the empirical analysis of thoughts and feelings is often viewed as either invalid or as legitimate and valid but largely unnecessary (Friman, Hayes, & Wilson, 1998; Friman, Wilson, & Hayes, 1998). The purpose of this paper is to offer a somewhat different analysis, making use of recent research in stimulus equivalence and related phenomena. We will then explore the applied implications of our analysis with particular emphasis on application of the analysis to drug abuse.

THE SOCIAL CONSTRUCTION OF PRIVATE EVENTS

In a behavior-analytic approach, private events are, in an important sense, public events: "Self-knowledge is of social origin. It is only when a person's private world becomes important to others that it is made important to him. It then enters into the control of the behavior called knowing" (Skinner, 1974, p. 31). In essence, Skinner's line

of thinking argues that the social-verbal community shapes the identification of private events and the subsequent stimulus control these events exert. Skinner (1945/1972, p. 378) pointed out that "differential reinforcement cannot be made contingent upon the property of privacy." He suggested four primary means by which the verbal community circumvents the problem of privacy and shapes verbal responses under the discriminative control of private events, that is, self-knowledge:

1. Private stimuli are correlated with publicly accessible stimuli. For example, a skinned knee or a bump on the head is a publicly observable event that is well correlated with pain as a private event. It is possible for the social-verbal community to teach a child to say "that hurts" in response to private pain stimuli because people often can see what has happened to the child to cause pain, and thus can teach the child to make such a verbal report.

2. Publicly accessible responses are correlated with private stimuli. For example, flinching when a tooth is touched is well correlated with a toothache. This allows the verbal community to shape talk about the privately experienced painful stimulation.

3. Publicly shaped responses to publicly available stimuli may recede in magnitude, and thus become private. An example of this might include rehearsing lines of a play aloud, eventually leading to rehearsing them in silent self-talk or "thought." Similarly, a child learns to suppress overt speech, especially in school, but may still engage in private forms of such speech (see also Skinner, 1957, p. 141).

4. Responses to public stimuli may be metaphorically applied to privately felt states. Skinner offers, as examples, terms such as *agitated, ebullient,* and *depressed.* These terms originally referred to events in the external world with which people interacted. To illustrate, when a jar of liquid has some powder placed in it and is agitated, the two may become mixed together and

move this way and that. They are unsettled. Similarly, when individuals experience unusual events that "shake them up," their physical state and their behavior may become less predictable. They may say that they feel unsettled. Skinner suggested that such metaphoric description or knowledge is particularly imprecise, owing to the intrinsic imprecision of metaphor.

These four sources of control over knowledge of private events have withstood the test of time within behavior analysis, and the basic conceptualization seems behaviorally sound. But Skinner added something else about the role of private events: "Self-knowledge has a special value to the individual himself. A person who has been 'made aware of himself' is in a better position to predict and control his own behavior" (1974, p. 31). We believe that this claim provides a window on the traditional behavioral account of private events that reveals a needed augmentation. Why would knowledge of private events put an individual in a better position to predict and control his or her own behavior? Asked in a more technical way, why would discriminated responses to one's own private responding exert behavior-regulatory functions over any subsequent responding?

THE IMPACT OF SELF-KNOWLEDGE

There seems to be little disagreement that human self-knowledge has behavioral functions. Consider a common human scenario: A person privately describes his previous impulsive alcohol consumption and its long-term costs, and subsequently shows more self-control. In this case, self-knowledge has been associated with some healthy degree of insensitivity to short-term contingencies. We believe that these were the kinds of things that Skinner was referring to in describing the impact of self-knowledge. The problem is that these behavioral results cannot come from self-knowledge as a

simple discriminated operant. Understanding why a simple discriminated operant analysis of self-knowledge is unworkable will help us to explain why recent developments in the analysis of verbal behavior can expand and improve on traditional behavioral analyses of the role of private events.

Consider an operant experiment modeled after the self-control scenario. A pigeon is given a choice between a very small amount of food immediately or a large amount delayed a few seconds. In these circumstances, pigeons will choose the small immediate reinforcer (Rachlin & Green, 1972). Suppose we now teach the bird to "tell" which reinforcer was obtained, the immediate or the delayed, by reinforcing some other response under the antecedent stimulus control of the delay between its last key peck and the amount of access to the food hopper. The bird is performing an act of discrimination regarding its own behavior, a form of self-knowledge (see Shimp, 1981, 1982). However, we have no reason to suppose that the bird will now choose the large delayed reinforcer when reintroduced to the original choice. The report is occasioned by the choice, but in order for the report to change the functions of the discriminative stimuli in the choice situation, it would have to be bidirectionally related to that situation.[1] Simply providing a history of reporting would not accomplish this task. Similarly, respondent conditioning appears to be a largely unidirectional conditioning process. Backward conditioning rarely occurs and, even in the limited conditions in which it appears to, is extremely weak and transitory (Hall, 1984; Mackintosh, 1974; see also Wilson & Blackledge, in press, for extended discussion).

We return now to the idea that "self-knowledge has a special value to the individual himself" (Skinner, 1974, p. 31). In cases of self-knowledge in nonverbal organisms, it seems unlikely that there would be such special value. Further, we know of no empirical example in the animal literature that would contradict the example we have chosen.

The Implications of Bidirectional Verbal Processes for Self-Knowledge

Self-knowledge is very different for a verbally competent human than it is for a nonverbal organism. The reason is straightforward: Human verbal behavior is known to be bidirectional in its relation to other stimuli. The simplest way to make this argument is to consider the literature on stimulus equivalence. Many studies have demonstrated that when training is provided sufficient to form an equivalence class, various psychological functions will transfer among those stimuli, without regard to the sort of temporal ordering required in typical classical and operant conditioning paradigms. Functions demonstrated to transfer among members of an equivalence class in humans include conditioned reinforcing functions (Hayes, Brownstein, Devany, Kohlenberg, & Shelby, 1987; Hayes, Kohlenberg, & Hayes, 1991), discriminative functions (Dymond & Barnes, 1995; Hayes et al., 1987), emotion-eliciting functions (Dougher, Augustson, Markham, Greenway, & Wulfert, 1994; Roche & Barnes, 1997), and extinction functions (Dougher et al., 1994).

Stimulus equivalence and other forms of derived stimulus relations are clearly involved in human verbal behavior, regardless of one's interpretation of this relationship (e.g., Hayes & Hayes, 1992; Horne & Lowe, 1996). Empirically, we know that preparations used in the study of derived stimulus relations can be used directly to train basic verbal performances. For example, reading can be taught through equivalence (e.g., Sidman, 1971) or exclusion (e.g., de Rose, de Souza, Ros-

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[1] Bidirectionality refers to the fact that the transformation of stimulus function seen among members of a relational frame does not require any particular temporal ordering, unlike classical or operant conditioning.

sito, & de Rose, 1994) procedures. In addition, equivalence correlates with basic verbal abilities in humans (e.g., Devany, Hayes, & Nelson, 1986). Indeed, what we mean by such concepts as a *symbol* or a *word* seems to require bidirectional stimulus relations.

Derived stimulus relations occur with humans at a very early age. If a 16-month-old child learns to select Stimulus A when Stimulus B is present, he or she will then select (without explicit experimental training) Stimulus B when Stimulus A is present (G. Lipkens, Hayes, & Hayes, 1993). At least by 23 months, human children taught to select Stimulus A in the presence of Stimulus B, and to select Stimulus A in the presence of Stimulus C, will then select Stimulus B in the presence of Stimulus C (Devany et al., 1986; G. Lipkens et al., 1993). Many forms of arbitrarily applicable stimulus relations (what we call *relational frames*; Hayes & Barnes, 1998) can be learned and can combine into networks of great complexity (Dymond & Barnes, 1995; R. Lipkens, 1992; Roche & Barnes, 1997; Steele & Hayes, 1991).

Skinner recognized the ubiquity of bidirectionality in his descriptions of verbal behavior. In one example, Skinner describes an individual who hears an electrician say "This is a Jones-plug." According to Skinner, "The effect on the listener is not only to establish *Jones-plug* as an appropriate tact but to set up nonverbal behavior in response to similar stimuli, for example, behaving correctly when asked *Please hand me a Jones-plug*" (Skinner, 1957, p. 360). In Skinner's analysis, such bidirectionality was the result of a long history of the use of verbal operants. Although he offers detailed operant analyses of the emergence of tacts and mands, he offers no technical analysis of the emergence or maintenance of more complex verbal operants that clearly involve bidirectionality. The literature on equivalence and its emergence in infancy did not exist in 1957. If it had, bidirectionality might have

played a more central role in Skinner's technical account of the formation of these verbal operants and their impact in areas such as self-knowledge.

The key here for our present purpose is that human verbal behavior functions bidirectionally. It is on that foundation that the behavioral impact of self-knowledge stands. Suppose one learns for the first time that another name for lemon is *betrang*. Now spend a few moments imagining what it would feel like to cut open a big, juicy betrang, and squeeze out all the betrang juice into one's mouth. Some readers of this article probably are now salivating, or feeling their teeth to be on edge, even though their experience with betrangs is limited to this paragraph. Such transfer of elicitation through equivalence classes has been repeatedly demonstrated in well-controlled laboratory conditions (Dougher et al., 1994; Roche & Barnes, 1997). Notice that the word *lemon* preceded *betrang* in the phrase *another name for lemon is betrang*. Classical conditioning cannot account for the transfer of function from *lemon* to *betrang,* because the stimuli were introduced in the wrong order. However, order was not important because, due to the bidirectional functioning of words, the phrase established an equivalence relation between the two. Some of the functions of *lemon*—probably themselves dependent on an equivalence relation between *lemons* and actual lemons, which enabled the transfer of some of the functions of the actual event to the word—then transferred to *betrang.*

We argue that this same process makes self-knowledge both important and useful on the one hand and often emotional and difficult on the other (Hayes & Gifford, 1997; Hayes & Wilson, 1993; Wilson & Blackledge, in press). It is useful because verbal reports can alter the impact of defective contingencies that may be described. Developmental studies have shown a gradual transition in the impact of self-instructions in dealing with, for exam-

ple, temporal delay (Bentall & Lowe, 1987). But in a different direction, clinicians are persistently confronted with the emotional nature of self-knowledge. For example, persons who have experienced a traumatic event seem to reexperience the aversiveness of the event in the report of it. Indeed, it is often very difficult to get victims of trauma to discuss traumatic events at all. We believe that this is so because the verbal report carries with it some of the functions of the original trauma. This same bidirectionality can help heal trauma, however. If the person is able to discuss the original trauma freely and nondefensively, this kind of verbal exposure can change the emotional and other behavioral functions of the actual stimuli associated with the trauma, such as riding in an automobile for a person who has been in a terrible accident (see Pennebaker, 1997, for a review).

Our larger point is this: Private events such as "emotions" need to be considered in an account of complex human behavior because private events involve two sets of contingencies, both verbally presented and directly experienced. These verbal contingencies can establish a functional role for private events, based in particular on the bidirectionality of human language, that would simply be missed if these events were not considered.

PRIVATE EVENTS AS THE LANGUAGE OF HISTORY

Why does the verbal community spend as much time as it does teaching children to discriminate private events? Why do we wish to know what a child is thinking and feeling?

Feelings, Metaphor, and Analogy

We argue that talk about feelings is important to the verbal community because these terms give access to the response implications of an individual's history that are idiosyncratic and difficult to interpret. For example, the verbal community usually asks "Do you feel lonely?" instead of "Have you been deprived of access to social interaction?" because being in a position in which socializing is a valued activity is not a simple issue of social deprivation. Sometimes social interactions can be aversive. In such situations a person may "feel" like being alone, but not feel lonely. Sometimes people say they feel "alone in a crowd," and thus social deprivation may be functionally present but formally absent. When seeing a picture of dead pet, a person may "feel lonely" even though the loss occurred years ago. Seeing someone else who appears to have many friends may make a person aware of a relative degree of social poverty, and the person may begin to feel lonely without any change in the frequency of social interactions. These details are complex and myriad, and there is no well-agreed-upon way to combine them. Issues of behavioral history are critical to social communication, but the most important social implications of a behavioral history can be communicated efficiently through the language of feeling and thinking. If a person says to you "I feel lonely," it is likely that, whatever his history, your company would probably be reinforcing to him.

Emotional talk is under the functional control of a complex, fuzzy set of events including behavioral predispositions, bodily sensations, contextual features, and so on, and this talk seems to be produced in part to alter the person's social environment. In that sense, human emotions are not specific things that are to be discovered, contrary to what most of psychology has assumed. Instead, emotions are constructed in the process of the verbal community teaching the child to tell others about a set of historical facts and a current context, information that is too complex and too cumbersome to recall in detail.

It is incorrect to think of verbally known emotions in social terms, however, without realizing the impact they have on the person feeling them. The

person feeling such complex emotions as depression or anxiety does not experience them as being socially constructed under multiple sources of stimulus control including a mix of bodily states, historical facts, and current contextual cues, but as "really being there." An illusion can be created in which a person must deal with depression in much the same way that a person must deal with a stone in his or her shoe or a bus rolling down the street towards him or her.

If emotions are fuzzy social-verbal constructions, how are people taught to describe (construct) them? Skinner's four methods cover the ground well, provided only that we augment his account with the bidirectional and relational nature of metaphor. Metaphor consists of relating sets of relations among events. Through verbal metaphor, a variety of subtle distinctions can be made about private events. Complex sets of relations verbally constructed in one domain in which events are quite public can be related to another, largely private domain in which only individual components are publicly available. This can bring a set of relations to bear on material that is largely or wholly unavailable to the social-verbal community.

For example, suppose in therapy we say "your relationship to anxiety is like being in a tug of war with a monster. You don't need to win the war, you need to drop the rope." The metaphor describes a set of relations in a public domain, and gives a few links to the private domain (e.g., the monster is anxiety). Other events in the private domain need to be discovered or constructed to fit the metaphor. It is not clear exactly what events correspond to "dropping the rope," for example. In the metaphor, a cessation of struggle is implied. The person hearing the metaphor may search for private responses that could individually or collectively correspond to this aspect of the metaphor in much the say way as the public events do. When the person later says "I've just learned to let go" the phrase

"let go" may refer to private actions that the public community would have a very difficult time describing, training, or discriminating without the bidirectional nature of human language.

Talk about thoughts and feelings is under multiple sources of control. "Emotions" can be descriptions of private events, but what is described is often a fuzzy set of events. For example, emotions are not merely bodily sensations, even though emotions may include bodily sensations. Emotional and cognitive talk are forms of discourse that serve as predictions of future events, or can alter the social environment through the persuasion of others or through an appeal to conventional reasons and explanations for behavior. Private events conceived of this way are not merely a coproduct of direct contingencies related to overt behavior, but instead are the product of both direct and verbal contingencies. Their verbal nature often requires that they be understood as components of complex instances of human behavior in which direct contingencies do not tell the whole story, either pragmatically or descriptively, and must be augmented by the contingencies that operate in verbal behavior.

THE EXAMPLE OF
DRUG DEPENDENCE

As a kind of extended example of these points, in this section we will apply our analysis to a clinical problem. We have chosen drug dependence in part because it presents such an enormous public health problem (Rice, Kelman, & Miller, 1991) and in part because some behavioral approaches to drug dependence illustrate the need for further understanding of the role of thinking and feeling. We will develop this example gradually over several steps.

Traditional Behavioral Principles and Drug Dependence

Given the appropriate learning history, stimuli that have no obvious for-

mal relation to a response can come to exert control over the response. Thus, a light in an operant chamber can come to occasion lever pressing for food pellets, an example of discriminative control. Also, pairings of some arbitrarily selected stimulus with an established reinforcer can cause the arbitrary stimulus to become a conditioned reinforcer. Further, reliable pairings of formally different stimuli can also produce various elicited responses, such as salivation, which we know as classical conditioning.

These various direct conditioning effects have been used to explain addictive behaviors, for example, drug craving, or some forms of withdrawal symptoms. Suppose a heroin addict experiences conditioned craving or withdrawal symptoms when he or she sees a car similar to the one driven by his or her drug connection. A classical conditioning analysis of this example would appeal to a history in which drugs were reliably paired with the presence of the drug connection's car. This sort of effect can be reliably produced in experiments with nonhuman subjects (e.g., Wickler & Pescor, 1967) and has been observed among detoxified opiate addicts returning from treatment to their old neighborhoods (Wickler, 1977). Besides elicited responding, a number of researchers have investigated discriminative (Bickel & Kelly, 1988) and conditioned reinforcing effects (Kelleher & Goldberg, 1977) as they relate to addiction.

One way to alter the effects of stimuli whose conditioning histories lead to the maintenance of problematic drug use is to remove the stimuli themselves. Some interventions, such as treatment communities, advise "relocation of the client to the residential environment" in order to "avoid the usual settings and circumstances historically associated with drug abuse" (De Leon, 1988, p. 86; Washton, 1988). The positive effects of relocation can be seen among Vietnam-era U.S. Army personnel. Those individuals who began their drug use while overseas had very low relapse to drug abuse upon returning home (Robins, Davis, & Goodwin, 1974). Animal studies have also demonstrated this effect. Rats that have been withdrawn from morphine show more rapid readdiction when they are returned to the environment where the addiction originally occurred as opposed to a novel environment (Cushman, 1974).

Bickel and Kelly (1988) have suggested, though, that when drug-related stimuli are numerous and widely distributed, removal from such stimuli may be impractical (DeGrandpre & Bickel, 1993; cf. Drummond, Cooper, & Glautier, 1990). Thus, other intervention strategies have sought to alter the stimulus functions of existing environmental cues as an alternative to removing the actual stimuli.

Aversive counterconditioning has been used to counteract the reinforcing properties of various drug stimuli by pairing the stimuli with some aversive event, such as shock or chemically induced nausea (e.g., Cannon & Baker, 1981). The goal of these treatments is to produce revulsion in the presence of drug-related stimuli, including the drug itself. Some evidence suggests that subjects who show greater conditioned aversion posttreatment had superior outcomes at follow-up than did subjects with less aversion (Rimmele, Miller, & Dougher, 1989).

Besides counterconditioning, a variety of research groups have pursued programs aimed at understanding the establishment and reduction of various forms of elicitation. Results of this work include an array of procedures that extinguish conditioned responses to drug cues (e.g., Dawe et al., 1993; McLellan, Childress, Ehrman, O'Brien, & Pashko, 1986; Monti et al., 1993; Rawe & Russell, 1980). Although several of these strategies have produced better outcomes than control conditions, the data are somewhat mixed (e.g., Rawe & Russell, 1980). The lack of clarity in the data is twofold. First, somewhat surprisingly, the treatments are not as powerful as animal models

might lead us to expect. Childress, Ehrman, Rohsenow, Robbins, and O'Brien (1992) conclude that, for substance abusers, "passive cue exposure (extinction) effects can be demonstrated, but the effects are modest" (p. 65; cf. Drummond et al., 1990).

Second, and even more perplexing than the modest effects, the putative change processes do not seem to fit the existing data. A number of researchers have reported a failure of cue exposure to reduce significantly physiological responses to drug stimuli (Childress, McLellan, Ehrman, & O'Brien, 1988; Drummond & Glautier, 1994). In studies in which cue exposure does yield improvements in clinical outcomes, the precise mechanisms of action are unclear. These differences between what animal models of conditioning would lead us to expect and actual outcomes with human subjects are not limited to substance abuse. Among phobics, for example, changes in arousal levels over the course of treatment do not predict subsequent avoidance (Barlow, Leitenberg, Agras, & Wincze, 1969; Leitenberg, Agras, Butz, & Wincze, 1971). As with extinction procedures involving drug stimuli, the treatments have a positive effect, but change in conditioned arousal does not necessarily predict improvement, as it should if the processes are based entirely on direct conditioning. From a traditional behavioral viewpoint on emotion, this seems problematic. If overt responding and emotional reactions are coproducts of the same contingencies, we ought not to see major discrepancies between physiological responses and overt behavior, either among phobics or drug addicts.

The lack of a straightforward connection between exposure, cue reactivity, and subsequent relapse has led a number of researchers to speculate on mediating variables such as improved self-efficacy, the establishment of coping strategies, or positive expectancies about the effects of the drug (e.g., Drummond & Glautier, 1994; Marlatt, 1990; Marlatt & Gordon, 1985; Monti, Rohsenow, Abrams, & Binkoff, 1988). Other researchers have suggested that conditioned responses may be sensitive to emotional states. Childress et al. (1994), for example, suggest that besides actual drug stimuli, mood states such as depression and anger may also alter the functions of antecedent and consequent stimuli. As evidence, these researchers found that induction of certain mood states reliably increased opiate craving and withdrawal-like symptoms upon exposure to drug cues.

Simple appeal to private events such as emotions, expectancies, self-efficacy, and the like is problematic to behavior analysts for at least three reasons. First, we do not know the processes whereby these cognitive and emotional responses exert behavior-regulatory functions over subsequent overt responding. At best these are behavior–behavior relations to be contextually interpreted, not accepted as originating causal events (Hayes & Brownstein, 1986). Behavior analysts reject the use of dependent variables to explain dependent variables (especially given the goal of behavioral influence, not mere prediction), and all forms of responding (including emotional and cognitive responding) are the dependent variables of behavior analysis (Biglan & Hayes, 1996).

Second, private events do not seem to affect overt responding in any simple mechanical way (Hayes & Wilson, 1995). Instead, the behavior–behavior relation appears to be under contextual control. Arousal in the presence of drug stimuli is not readily distinguished, at the level of physiology, from other sorts of arousal. Salivation, sweating, anxiety, and other such bodily states are functionally different things for different persons in different contexts. Arousal on a roller coaster is "fun." Among drug addicts, however, high arousal may mean "I need to get to a Narcotics Anonymous meeting" for one person, whereas it might mean "treatment isn't working so I might as well get high" for another. In either instance, this arousal is not "fun." In

terms of behavioral outcomes the arousal has markedly different functions. The roller coaster is approached (more tickets are purchased), whereas the situations generating arousal among the addicts are avoided (either by going to a meeting or by using).

Finally, most psychologists use emotion or thought to explain overt behavior in an inherently mentalistic fashion. Among self-efficacy theorists, for example, thinking that one may be effective at accomplishing a task is said to cause one to be effective in accomplishing that task (Bandura, 1995). These common theoretical problems do not mean, however, that a behavioral analysis of the role of private events must likewise be causal, mechanistic, and mentalistic (Hayes & Brownstein, 1986; Hayes & Wilson, 1995). Behavior analysts also need not, and ought not, ignore private events on the basis of their being interesting, but irrelevant, epiphenomena (Forsyth & Eifert, 1996). Approaches exist that fit better within behavior analysis and that take into consideration both the direct effects of contingencies and the indirect effects of verbal contingencies involved in cognition and emotion.

A Relational Stimulus Function View of Relapse

To illustrate the role of thoughts and feelings in instances of relapse to drug dependence, we will begin by considering a nonclinical example. We will use the language of relational frame theory, but will not defend that use here (for an exposition, see Hayes & Barnes, 1998; Hayes, Gifford, & Wilson, 1996; Hayes & Wilson, 1993, 1996). The strength and type of responding occasioned by a stimulus event that has its psychological functions as a result of relational responding are due to both history and current context. Consider the simple frame of coordination between the word *car* and actual cars. First, imagine hearing the words "Visualize a car speeding toward you," spoken in a normal tone of voice, while standing in your kitchen (see Context 1, Figure 1). In this example, the word *visualize* serves a discriminative function for the operant of seeing in the absence of the thing seen (Skinner, 1957). In the context of the word *visualize,* the word *car* will make psychologically present the visual features of an actual car. The words *toward you* would make present the visual features of the front of a car. The word *speed* would select for some of the stimulus features that distinguish stationary from speeding cars. Our psychological history with respect to these verbal and nonverbal events are not thoroughly compartmentalized by contextual cues. We may do more than "see" when asked to visualize. Because we have a history in which seeing speeding cars is accompanied by the sounds that speeding cars make, we may "hear" a roaring engine. If we are particularly adept at imagining, we may even experience some weak visceral effects of seeing an approaching car, such as slightly increased muscle tension. It would be unlikely, however, to observe the emergence of any overt behaviors, such as leaping about the kitchen in order to avoid the "speeding car." In other words, the current non-imagined environment is still exerting considerable control over behavior.

Consider next the same frame of coordination in a different context. Imagine hearing the words "Watch out for that car!" spoken in an urgent tone and high volume while standing in the middle of an intersection (see Context 2, Figure 1). In this context, the tone and volume of the speaker's voice, along with our physical location, would bring to bear a full array of psychological functions with respect to the word *car.* We might show many of the visceral and overt behaviors that would be occasioned by seeing an actual car. For example, we might experience increased muscle tension, respiration, and heart rate, and might leap from the roadway.

Finally, imagine hearing the words "Watch out for that car!" spoken again
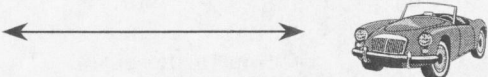
FRAME OF COORDINATION		
"Car" ←————————→ 🚗		
	Contextual cues controlling which functions of "car" are transformed	**Psychological functions that are transformed**
Context #1 "Visualize a car speeding toward you." (kitchen)	Event occurs in the kitchen, voice volume and tone are consistent with conversation	Visual functions transformed and possibly some weak transformation of visceral functions (seeing the approaching car, perhaps some tensing of muscles, no overt behavioral functions)
Context #2 "Watch out for that car." (intersection)	Event occurs in the street, volume and tone are consistent with warnings of environmental dangers	Visual, visceral, and overt behavioral functions transformed, (activation of a wide variety of bodily states, muscle tension, increased respiration, increased heart rate, altered peripheral blood flow, running toward the roadside, visual scanning of the environment, many overt behavioral functions present in avoiding an actual speeding car would be psychologically present)
Context #3 "Watch out for that car." (kitchen)	Event occurs in the kitchen, voice volume and tone are consistent with warnings of environmental dangers, (history and behavioral repertoires with respect to this event in this context would be nonexistent)	Cognitive functions transformed (e.g., thoughts about cars, such as "huh, there aren't any cars here," context of incongruous contexts leads to transformation of cognitive functions about speaker "Is he nuts?," few functions of actual cars would be present, no overt behavioral functions, possibly some immediate and transient visceral functions owing to the volume and tone)

Figure 1.   Contextual features controlling which stimulus functions of actual cars will be present upon hearing the word *car*.

in an urgent and loud voice, but occurring in the kitchen (see Context 3, Figure 1). This example presents a mix of contexts with which we are unlikely to have had any prior experience. The tone of voice alone might cause some highly transient occasioning of alarm reactions, such as muscle tensing and increased vigilance. However, we are unlikely to have an elaborate behavioral repertoire established in response to these words in this context. In this in-

stance, the only psychological functions likely to be present as a result of hearing the word *car* would be thoughts about cars, such as, "there aren't any cars here." We would not expect to see any of the overt behaviors seen in the previous example, and we would expect only a few brief private responses.

The Context of Literality

The social-verbal community establishes and maintains the verbal relations involved in literal meaning. In some contexts an individual responds to an event that is part of a derived stimulus relation with another event by emitting many of the responses we would expect to see if the second event were actually present. We have termed the social-verbal context that generates such behavior the *context of literality* (Hayes, Strosahl, & Wilson, 1999; Hayes & Wilson, 1994). The extent to which we see the emergence of psychological function through these relations is a matter of degree, so we may salivate when we hear the words "imagine the taste of a lemon," but we do not eat the word *lemon*. And, as seen in the *car* examples above, which psychological functions transfer is under contextual control. All three of the *car* examples involved the context of literality, in that when the listener heard the word *car,* more than the simple auditory functions of that word were present. However, in Contexts 1 and 3, the listener's behavior was much more under the control of events other than the verbal stimulus *car.* In Context 2, by contrast, the contextual conditions conspire to bring the listener's behavior almost completely under the control of the word *car.* It is as if the car itself had been sensed (seen, heard, etc.).

Adaptive features of the context of literality. The context of literality does not produce all of the responses to an event literally described by a verbal term, but it does occasion many of them. As in the example provided

above, a verbally competent human can respond to the verbal stimulus "Watch out for that car!" much as if they were responding to an actual car. In this situation, rapid responding is necessary in order to avoid danger. If there were actually a car speeding toward you, we would want a full array of potential responses immediately available. Verbal stimuli are effective in part because of this transfer of stimulus functions from the events to which words are related, and the words themselves, in this case, between the words *speeding car* and the actual speeding car. Skinner proposed the term *rule-governed behavior* precisely because certain human behaviors can come under the control of what Skinner called defective contingencies, that is, contingencies that would be unlikely to occasion adaptive behavior in and of themselves. Some examples of defective contingencies include those that are too remote (e.g., getting a PhD), small, or only cumulatively potent (e.g., the health consequences of smoking), or as in the current example of the oncoming car, not directly discriminable by the person to be affected. When the words are ones like "work long and hard and you will get your doctorate," or "don't smoke, it will kill you," or "watch out for that car," the more potent the functions exerted by the words, the more likely we will behave effectively. Humans generate a lot of words, though, and responding to some of them as if they were "the real thing" can get us into a lot of trouble.

The Context of Social Regulation and Reason Giving

A second context that knits together behavior–behavior relations between cognition and emotion on the one hand and more overt behaviors on the other is the context of social regulation and reason giving. The verbal community teaches us to talk about our histories in the shorthand language of wants, wishes, desires, dispositions, thoughts, and

memories. If "good reasons" are given for behavior, the social community may alter how a given instance of behavior is treated. The verbal community demands a certain level of correspondence, however, between the language of thoughts and feelings and expected patterns of overt behavior, and provides consequences for the maintenance of this correspondence. If, for example, someone explains their drug relapse by saying, "I was very depressed," they will be thought to have said something sensible. Having a "good reason" for the relapse is likely to generate some sympathy and to lessen socially imposed negative consequences. If, however, there are not other overt signs of depression, the person expressing such a reason may eventually receive negative consequences for having "manipulated" the situation or having "lied."

Of course, the correspondence between thoughts and emotions on the one hand and overt behavior on the other is not perfect. Thoughts and feelings are not literally the causes of behavior. They participate as components of complex behavioral patterns that are in part maintained by socially mediated contingencies (e.g., social reinforcement for say-do correspondence). Thus, the correspondence between thoughts and feelings and overt action is only partial.

The Example of Relapse to Substance Abuse

The fact that stimuli can acquire psychological functions as a result of their participation in relational responses can illuminate the role of thoughts and feelings in relapse and also the effects of a variety of treatments. To illustrate the role of relational stimulus function in relapse, consider five relational frames that might be likely for a drug-dependent individual (see Figure 2).

Frame 1. Actual abstinence is likely to be in a frame of coordination with the word *abstinent.*

Frame 2. Abstinence (both actual and verbal) is likely to be in an "if . . . then" relational frame with various consequences (both actual and verbal).

Frame 3. Some of these consequences (both actual and verbal) are likely to be in a frame of coordination with the verbal label "having my life together."

Frame 4. Abstinence (both actual and verbal) is likely to be in a frame of opposition with drug use (both actual and verbal).

Frame 5. Unbearable cravings (verbal) are likely to be in an "if . . . then" frame with eventual relapse (actual and verbal).

Such a set of stimulus relations established by the verbal community provides a rich mix in which complex transformation of psychological function may occur. For example, imagine an individual who, while at work, is in a context that occasions the thought "Wow, I've really quit using." This instance of verbally described abstinence is in an "if . . . then" frame with actual and verbally described reinforcers (Frame 2 above), and may begin to acquire reinforcing effects because of that relation. Just as a countdown stimulus that predicts the arrival of a reinforcer will eventually itself come to be reinforcing, behaviors that support abstinence and abstinence thoughts can, through these derived relations, come to have reinforcing functions. As a result, an addict may work for the opportunity to engage in behaviors that make abstaining (both actual and as verbally described) more likely. In effect, it becomes reinforcing to think "I've really quit using," and extra effort may be expended (e.g., getting a ride to a Narcotics Anonymous meeting) to be in circumstances in which such a verbalization is likely.

Likewise if actual drug use and actual abstinence are in a frame of opposition (Frame 4), actual drug use would be in an "if . . . then" frame with the absence of these reinforcers. The formerly positive stimulus functions of drug use may be transformed
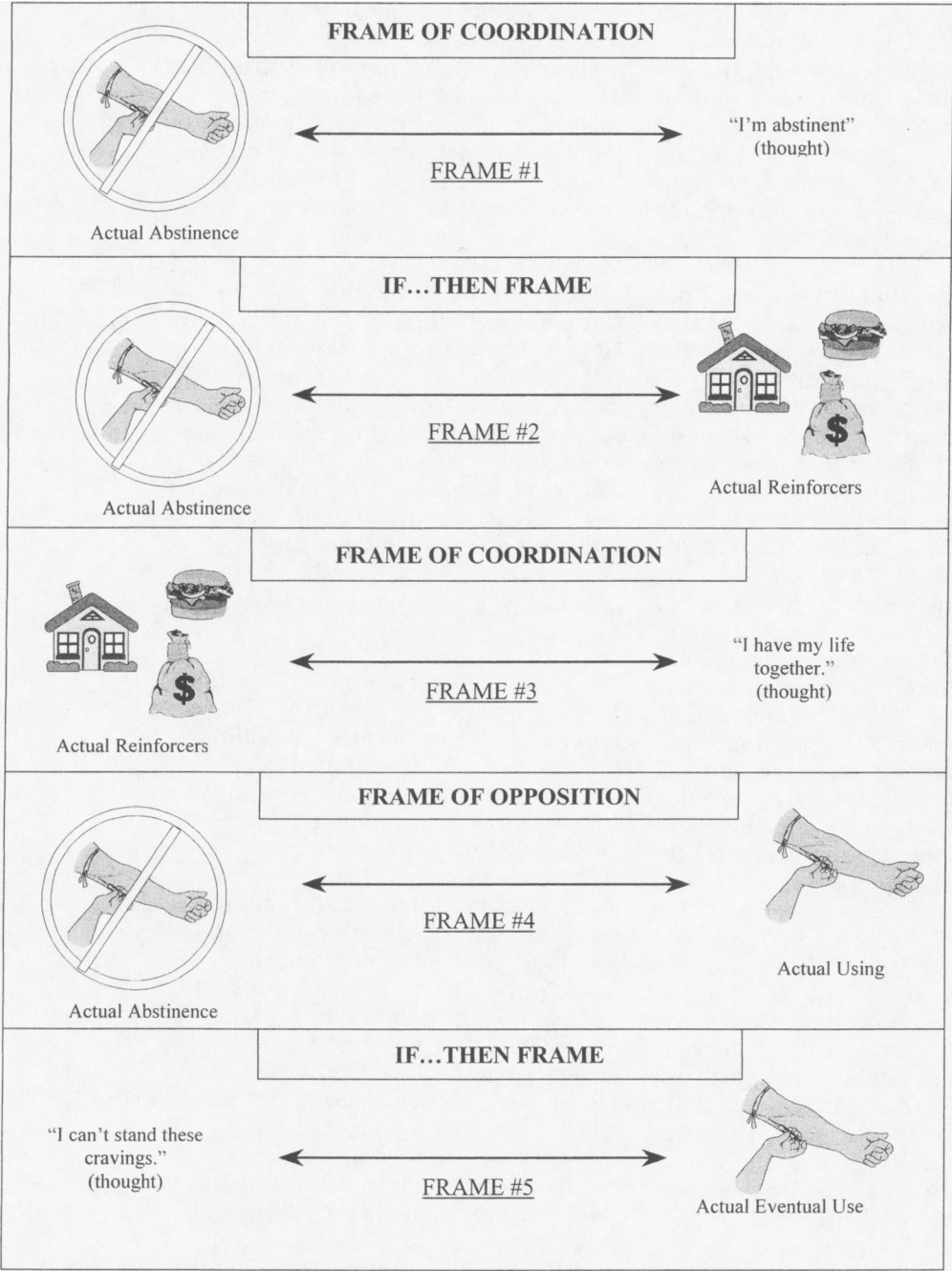
Figure 2. Examples of relational frames involving overt behaviors, stimulus events, thoughts, emotions, and bodily states as might be seen in a recovering drug addict.

into negative functions by the combination of Frames 2 and 4 for those persons who experience the positive impact of actual and verbal abstinence. This transformation of function can be quite adaptive, and may support the addict in forgoing immediate reinforcement provided by drug use (and likely

present in thoughts of drug use) in lieu of the more distal and slowly accumulating reinforcers available for not using. This clinical example is similar to those described in the analysis of self-control provided at the beginning of this paper, and are implied by Skinner (1974) in his quotation about the value of self-knowledge.

Unfortunately, verbal events can also support maladaptive behavior. This can happen in many ways. Verbal events and actual events are not the same thing, and the addict who is speaking of successful abstinence may also be engaging in small behavioral steps that will undermine abstinence, but initially not so dramatically as to challenge the verbal construction of successful abstinence. For example, the person who says "Wow, I've really quit using" may then begin to spend time with old, using friends, thus increasing the risk of relapse though exposure to direct contingencies. The person may not have self-knowledge of these behavioral changes and their risks, either because the actions are not verbally categorized as behaviors that will undermine abstinence or, perversely, because negative behaviors are framed positively (e.g., "My old friends are no longer a threat now that I've quit," or "If I've really quit I need to stop running away from situations like my old friends.").

Another kind of verbal support for relapse comes when events intervene to alter a verbal relation that was supporting successful withdrawal from drug use. For example, suppose an abstinent drug addict is arrested for an old drug felony. This might occasion thoughts such as "I'm going to lose everything I've worked for," or "It doesn't matter what I do or how hard I try." Such verbalizations could reflect and support a diminution of the "if . . . then" relation between abstinence and reinforcement in Frame 2. If abstinence (in a verbal sense) no longer seemingly predicts positive outcomes, then the verbal supports for abstinence will weaken.

An additional kind of verbal support for relapse occurs when verbal relations seemingly explain or justify drug use. For example, the statement "I can't stand these cravings" could temporarily augment the possible verbally constructed reinforcers for abstinence, or could marshal some degree of social sympathy for steps that make drug use more likely.

It is worth noting that these transformations of stimulus function are not *caused* by verbalizations, including self-verbalizations. Rather, the verbalization reflects and instantiates a stimulus relation that emerges from a specific history, occurs in particular environmental contexts, and has particular psychological effects due to these historical and situational events.

Implications for Understanding Treatment Strategies

Given this analysis, several interventions could be effective. One approach would be to alter the stimulus functions of certain key members of relational networks. Both cue exposure and aversive conditioning provide examples of this strategy. In fact, the effectiveness of many cue exposure, aversive conditioning, and other exposure-based treatments is more understandable given bidirectional transformation of stimulus function (including extinction functions; see Dougher et al., 1994). After all, treatments such as covert sensitization (Rimmele et al., 1989) may rely solely on verbally constructed images rather than on any direct exposure to alcohol or drugs.

The use of antidipsotropic medications in the treatment of alcohol likewise alters the stimulus functions of the drug, though again, the alteration of the functions of alcohol is likely to be verbal, because antidipsotropics are often effective even if the person never drinks alcohol while taking them. The physician puts the verbal event "alcohol" in an "if . . . then" frame with the verbal event "becoming deathly ill." The physician need not expose the pa-

tient to actual alcohol while describing the effects of the combination, nor does he or she need to have the person experience actual illness. In all likelihood, the drug will be effective when only verbal "alcohol" and verbal "illness" are presented. Transformation of stimulus function takes care of the individual's responding to the actual events.

Some of these treatments produce change by intervening on the antecedent end of addictive behaviors. That is, they enter the relational network verbally or in the environment by altering the stimulus functions of the drug. By contrast, motivational interviewing (Miller & Rollnick, 1991) likely has its main effects by altering the stimulus functions on the consequential end of the addictive behavior contingency. Motivational interviewing has shown good effects in a recent clinical trial among alcoholics (Project Match Research Group, 1997).

Motivational interviewing explicitly forbids direct delivery of social punishment of addictive behavior, but instead focuses on making psychologically more present the relation between the client's values and his or her addictive behavior. The therapist does not tell the client what to value and how addictive behavior is blocking those values. Instead, the motivational interviewer tries to set conditions in which the client describes the valued goals and the ineffectiveness of addictive behavior in reaching those goals. Any self-control, however, that emerges from discriminating contingencies that have been operating necessarily requires bidirectional transformation of stimulus function, as we have argued.

A sensible behavioral approach, based on the present analysis, is to attempt to alter the social-verbal contingencies that support the behavior-regulatory functions of private events. Our own approach, called Acceptance and Commitment Therapy (ACT; Hayes et al., 1999; Hayes & Wilson, 1993, 1994, 1995), takes exactly that tack.

ACT explicitly attacks not just the products of literality (particular psychological functions present in response to a word) but also the context of literality itself. That is, ACT attempts, through a variety of means, to disrupt the process of relational responding and the transformation of stimulus function by altering the contexts in which these occur. For example, suppose a person has the thought "I can't stand these cravings." In a normal, literal context this thought may have emotional functions (e.g., agitation, upset) that could be alleviated by drug use. If, however, the thought "I can't stand these cravings" is said 100 times rapidly, these emotional functions subside, and the direct, auditory functions of the words themselves become more salient. If the person visualized the words as if they were written on a leaf, and watched them float by in a meditative practice, much the same thing might occur. ACT uses a variety of such techniques in therapy to manipulate the context of literality itself (in ACT these are termed *deliteralization* or *defusion* techniques).

ACT has been shown to have wide-ranging clinical effects (e.g., Strosahl, Hayes, Bergan, & Romano, 1998), and data suggest that deliteralization is one of the processes involved. For example, among depressed clients ACT produces a rapid decrease in the literal believability of supposedly depressogenic thoughts and a slower decrease in their occurrence and frequency, whereas cognitive therapy shows the opposite pattern (Zettle & Hayes, 1986; Zettle & Raines, 1989). We argue that these effects add to accumulating evidence that the impact of self-verbalizations is contextually determined, as it should be in a behavior-analytic model. We are currently examining whether ACT affects substance abuse in a large federally funded trial, and preliminary data are supportive (Wilson, Hayes, Gifford, & Chang-Judson, 1999). Controlled research has also shown that ACT aids in alleviating stress, anxiety, and depression (Bond & Bunce, in

press; Strosahl et al., 1998; Zettle & Raines, 1989), which are empirical correlates of drug abuse.

CONCLUSION

In some respects this analysis is out of the ordinary for behavior-analytic literature. For example, the above analysis of relapse could be construed as suggesting that people relapse *because* of thoughts about relapse. What distinguishes this account from a more traditional mentalistic account is that observable behavior (albeit sometimes observable by only 1 subject) is being related to independent variables found in the environment, which is, in principle, manipulable. Behavior–behavior relations exist between thinking and feeling (both of which, we argue, are verbal events for humans) and other forms of behavior, but this relation is itself due to manipulable contextual variables (Hayes & Brownstein, 1986; Hayes & Wilson, 1995).

We have attempted to specify various independent variables of which these behavior–behavior relations are a function. For example, we have identified the social context in which talk about cognition and emotion alters socially mediated contingencies: the context of social regulation and reason giving. We have tried to show that private events in humans are often verbal events that depend upon a context of literality for their meaning and impact (i.e., a social-verbal community to establish and maintain derived stimulus relations).

Basic behavior-analytic laboratories are beginning to show how such verbal processes operate in clinically significant areas. For example, DeGrandpre and Bickel (1993) have shown that interoceptive stimuli resulting from drug ingestion can participate in equivalence relations with arbitrary visual stimuli, and that discriminative control over drug consumption can transfer from drug-related to arbitrary visual stimuli via participation in equivalence classes (DeGrandpre, Bickel, & Hig-

gins, 1992). We also know that old equivalence classes (and potentially old stimulus functions) may reemerge under some conditions (Wilson & Hayes, 1996), and that attempts to suppress thoughts and feelings about substance-abuse-related words actually makes equivalence classes containing substance-abuse-related members more resistant to disruption (Wilson, 1998). Little stands between such sets of findings and a functional account of a verbally constructed emotion in drug ingestion, such as we have provided here.

Understanding verbal process may help us to make sense of some current treatments as well. For instance, cue exposure necessarily involves direct exposure and subsequent extinction of elicited responses to some, but not all, drug cues (e.g., Drummond et al., 1990; Monti et al., 1993). If some drug cues have their stimulus functions through derived processes, not simply through direct training histories (e.g., see DeGrandpre & Bickel, 1993; DeGrandpre et al., 1992), studies such as Dougher et al. (1994), showing transfer of extinction functions through equivalence classes, provide some hope that these procedures could be effective. However, findings by Pilgrim and Galizio (1990, 1995) suggest that we may also see changes in stimulus control for some members of a class but not others.

The empirical analysis of thought and emotion is entering a new era in behavior analysis. Direct conditioning accounts of emotion and thought could only go so far because of the verbal nature of human private events. Derived stimulus relations provide both an experimental avenue into the lion's den of human thought and emotion and a signpost indicating why entering is important. Philosophically, behavior analysis has been prepared to take this step for more than 50 years (Skinner, 1945/1972). Empirically, it seems time to proceed.

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